

What is claimed is:

1. A method of operating a graphics system having at least two performance levels, comprising:

monitoring as a function of time at least one attribute of said graphics system that is indicative of a level of graphics activity; and

selecting a performance level for said level of graphical activity to maintain a minimum desired display rate.

2. The method of claim 1, wherein said monitoring said at least one attribute comprises: monitoring at least one attribute indicative of utilization of a graphics memory.

3. The method of claim 1, wherein said monitoring said at least one attribute comprises: monitoring at least one attribute indicative of utilization of a graphics pipeline.

4. The method of claim 1, wherein said selecting said performance level comprises: increasing said performance level in response to detecting an over-utilization condition.

5. The method of claim 1, wherein said selecting said performance level comprises: decreasing said performance level in response to detecting an under-utilization condition.

6. The method of claim 1, wherein monitoring said at least one attribute comprises: monitoring a first attribute indicative of utilization within a graphics processor core clock domain; and

monitoring a second attribute indicative of utilization within a graphics memory clock domain.

7. The method of claim 6, wherein monitoring said first attribute comprises: monitoring the percentage of clock cycles in a graphics pipeline for which at least one stage is held up waiting for the results of another stage.

8. The method of claim 6, wherein said monitoring said second attribute comprises: monitoring the percentage of clock cycles in a graphics memory for which a memory bandwidth of said graphics memory is inadequate.
9. The method of claim 1, wherein said selecting said performance level further comprises:
 - selecting a core clock rate of a graphics processor.
10. The method of claim 9, wherein selecting said performance level further comprises:
 - selecting a clock rate for a graphics memory associated with said graphics processor.
11. A method of operating a graphics system having at least two performance levels, comprising:
 - monitoring as a function of time at least one attribute of said graphics system that is indicative of a level of utilization of at least one component of said graphics system for which over-utilization of said at least one component is likely to decrease a display rate of said graphics system below a normal display rate; and
 - selecting a performance level for which said level of utilization is not greater than an over-utilization threshold.
12. The method of claim 11, wherein said monitoring said at least one attribute comprises: monitoring at least one attribute indicative of utilization of a graphics memory.
13. The method of claim 11, wherein said monitoring said at least one attribute comprises:
 - monitoring at least one attribute indicative of utilization of a graphics pipeline.
14. The method of claim 11, wherein said selecting said performance level comprises:
 - increasing said performance level in response to detecting that said level of utilization is greater than said over-utilization threshold.
15. The method of claim 11, wherein said selecting said performance level comprises:
 - decreasing said performance level in response to detecting said level of utilization being below an under-utilization threshold.

16. The method of claim 11, wherein monitoring said at least one attribute comprises:
 - monitoring a first attribute indicative of utilization within a graphics processor core clock domain; and
 - monitoring a second attribute indicative of utilization within a graphics memory clock domain.
17. The method of claim 16, wherein monitoring said first attribute comprises:
 - monitoring the percentage of clock cycles in a graphics pipeline for which at least one stage is held up waiting for the results of another stage.
18. The method of claim 16, wherein said monitoring said second attribute comprises:
 - monitoring the percentage of clock cycles in a graphics memory for which a memory bandwidth of said graphics memory is inadequate.
19. The method of claim 11, wherein said selecting a performance level further comprises:
 - selecting a core clock rate of a graphics processor.
20. The method of claim 19, wherein selecting said performance level further comprises:
 - selecting a clock rate for a graphics memory associated with said graphics processor.
21. A method of operating a graphics system having a high performance level for processing complex three-dimensional graphical images and at least one lower power, lower performance level for processing less complex graphical images, the method comprising:
 - monitoring as a function of time attributes of a graphics pipeline and a graphics memory of said graphics system that are indicative of a level of utilization of said graphics system;
 - in response to detecting a level of utilization greater than an over-utilization threshold for which a display rate of the graphics system is likely to be significantly decreased below a normal display rate, selecting a higher performance level; and
 - in response to detecting a level of utilization below an under-utilization threshold, selecting a lower performance level to reduce power required by the graphics system.

22. A graphics system having at least two performance levels, comprising:
a performance level controller configured to monitor, as function of time, at least one attribute of said graphics system indicative of a level of graphics activity and to select a performance level sufficient to provide a desired minimum display rate.

23. The graphics system of claim 22, wherein said performance level controller monitors a graphics pipeline and a graphics memory interface.

24. The graphics system of claim 22, wherein said at least two performance levels comprise:
a low power three-dimensional graphics level having a first core clock rate and a first memory clock rate; and
a high performance three-dimensional graphics level having a second core clock rate and a second memory clock rate.

25. A graphics system, comprising:
a graphics processor having at least two performance levels, each performance level having an associated graphics processor core clock rate and a memory clock rate;
a graphics memory coupled to said graphics processor by a graphics bus and operable at said memory clock rate;
a performance level controller, said performance level controller configured to monitor, as function of time, at least one attribute of said graphics system indicative of a level of utilization of at least one component of said graphics system for which over-utilization of said component decreases a display rate, and
said performance level controller configured to increase said performance level to avoid over-utilization of said at least component;
said performance level controller configured to decrease said performance level from a high performance level to a lower performance level to avoid under-utilization of said at least one component.

26. A graphics system having at least two performance levels, comprising:
means for monitoring utilization of at least one component of said graphics system for which over-utilization of said at least one component decreases a display rate; and
means for selecting a performance level sufficient to provide a minimum display rate.

27. A method of operating a graphics system having at least two performance levels, comprising:

monitoring as a function of time at least one attribute of said graphics system that is indicative of a level of graphics activity; and

selecting a performance level for said level of graphical activity to maintain at least one performance criterion within an acceptable range.